a light-guiding object having an irradiation surface for receiving optical signals adjacent to a propagation path along which light primarily travels within said light-guiding means, said light-guiding object being substantially constructed of a synthetic material capable of causing elastic dispersion of optical signals received through said irradiation surface at angles between about 0 and 90 degrees relative to said irradiation surface and said synthetic material being capable of undergoing a population inversion by energetic excitation;

an excitation unit for inducing a population inversion within said synthetic material,

an optical signal coupled into said light-guiding means at said irradiation surface resulting in a radiation component of said optical signal in the direction of the propagation path of said light-guiding object due to elastic dispersion of said optical signal caused by said synthetic material; and,

a detector means optically coupled to said light-guiding object for detecting an amplified optical signal having an emission wavelength which corresponds to the wavelength of said optical signal, said amplified optical signal being produced by stimulated emission from the synthetic material caused by said radiation component of said optical signal when said excitation unit has caused a population inversion in said synthetic material.

10. The device of claim 1 wherein said light-guiding object comprises a fibre optical waveguide.

11. The device of claim 1 wherein said excitation unit comprises an optical pumped light source.

12. The device of claim 11 wherein said detector means comprises coupler elements selective by wavelength for optically decoupling light from said optical pumped light source from said amplified optical signal.

13. The device of claim 9 further comprising an emitter unit optically coupled to said light-guiding object at said irradiation surface wherein said optical signal is introduced into said light-guiding object through said emitter unit.

14. A method for processing optical signals comprising:

providing a light-guiding object with an irradiation surface for receiving optical signals adjacent to a propagation path along which light primarily travels within said light-guiding means being substantially constructed of a synthetic material capable of causing elastic dispersion of optical signals received through said irradiation surface and said synthetic material being capable of undergoing a population inversion by energetic excitation;

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inducing a population inversion in said synthetic material using an excitation unit; coupling an optical signal into said light-guiding means through said irradiation surface

creating a radiation component of said optical signal in the direction of the propagation path of said light-guiding object due to elastic dispersion of said optical signal caused by said synthetic material;

stimulating emission from the synthetic material by said radiation component resulting an amplified optical signal having an emission wavelength which corresponds to the wavelength of said optical signal; and,

detecting said amplified optical signal on a detector means optically coupled to said light-guiding object.

15. The method of claim 14 wherein said excitation unit comprises an optical pumped light source.